Liquid Crystal Display

LCD

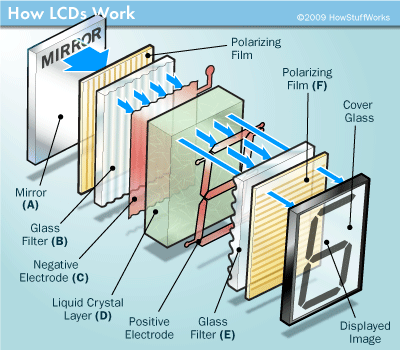
Background Information

Liquid crystals are used in:

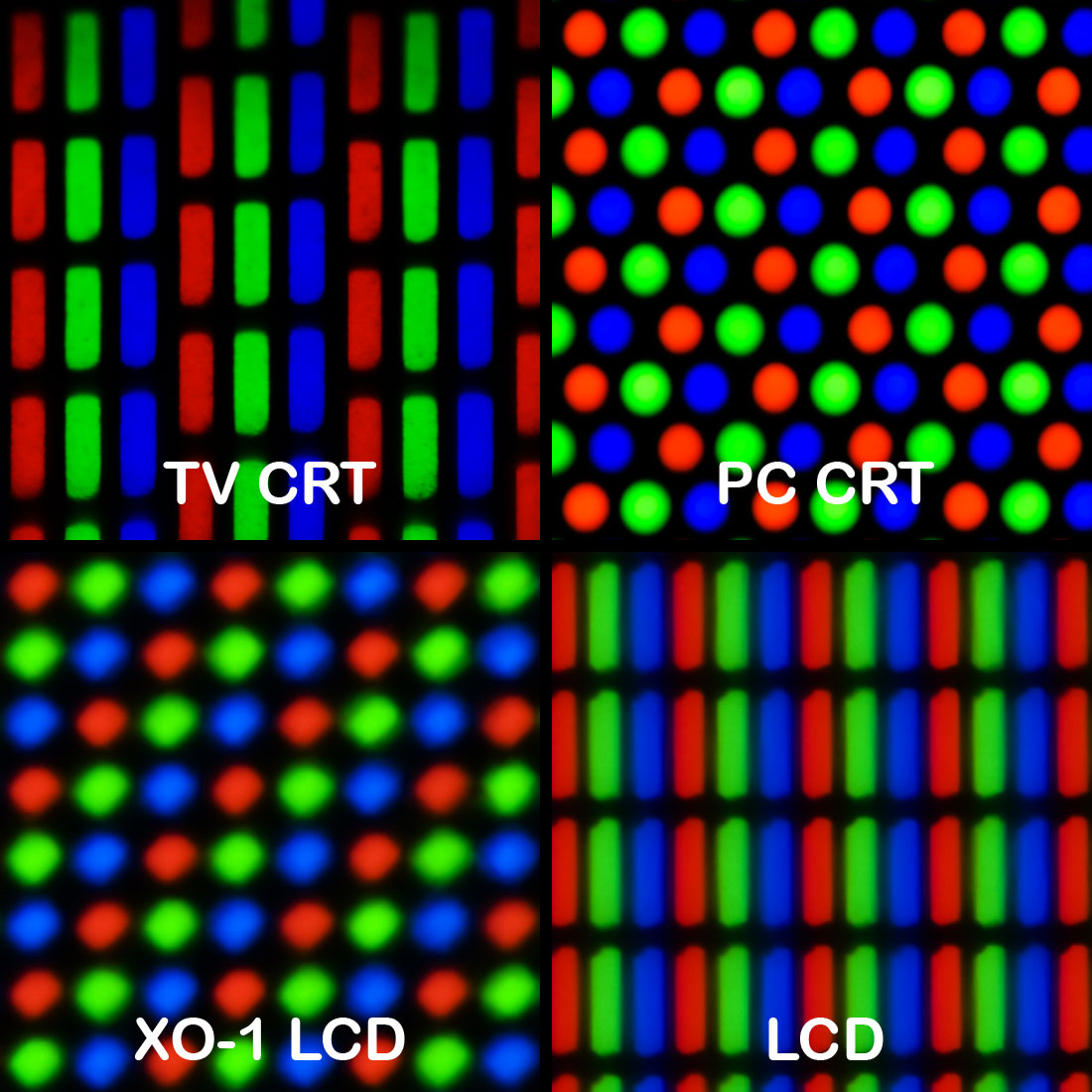
* Laptops, TVs, Digital clocks, Microwaves, and CD players

They are thinner, lighter, and draw less power.

Parts of LCD:



One pixel in LCD is made up of three subpixels of red, green, and blue.



1. Properties of Liquid Crystals

Their state of matter is between crystalline solid and isotropic liquid.

They are strong dipoles and they get easily polarized.

4 phases of liquid crystal:

* Nematic phases
* Smectic phases
* Cholestric phases
* Columnar phases

The Nematic liquid crystal phase is characterized by molecules that have no positional order but tend to point in the same direction.

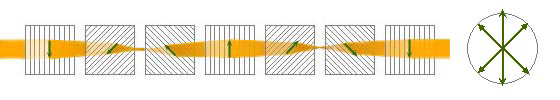
1. Polarization:

All crystal liquids are strong dipoles which mean that their molecules are polar. When an electric charge passes through them it changes their polarity and orientation.

Polarization of light:

A polarizer is a device that converts a beam of electromagnetic waves of undefined or mixed polarization into well defined polarization.

There are two polarisers in an LCD and each linear polarizer has a transmission axis. The transmission axis of the two polarizers is placed at 90° to each other. Only the light is oriented parallel to that axis is allowed through. If the light Is horizontal and the axis of the polarizer is vertical none will get through and the screen of the TV would look black. And if both are parallel all should get through.



1. Electrodes

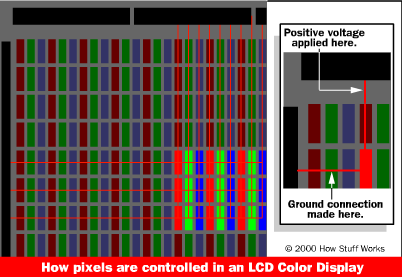
Electrodes are conductors that carry electrons into and out of a cell.

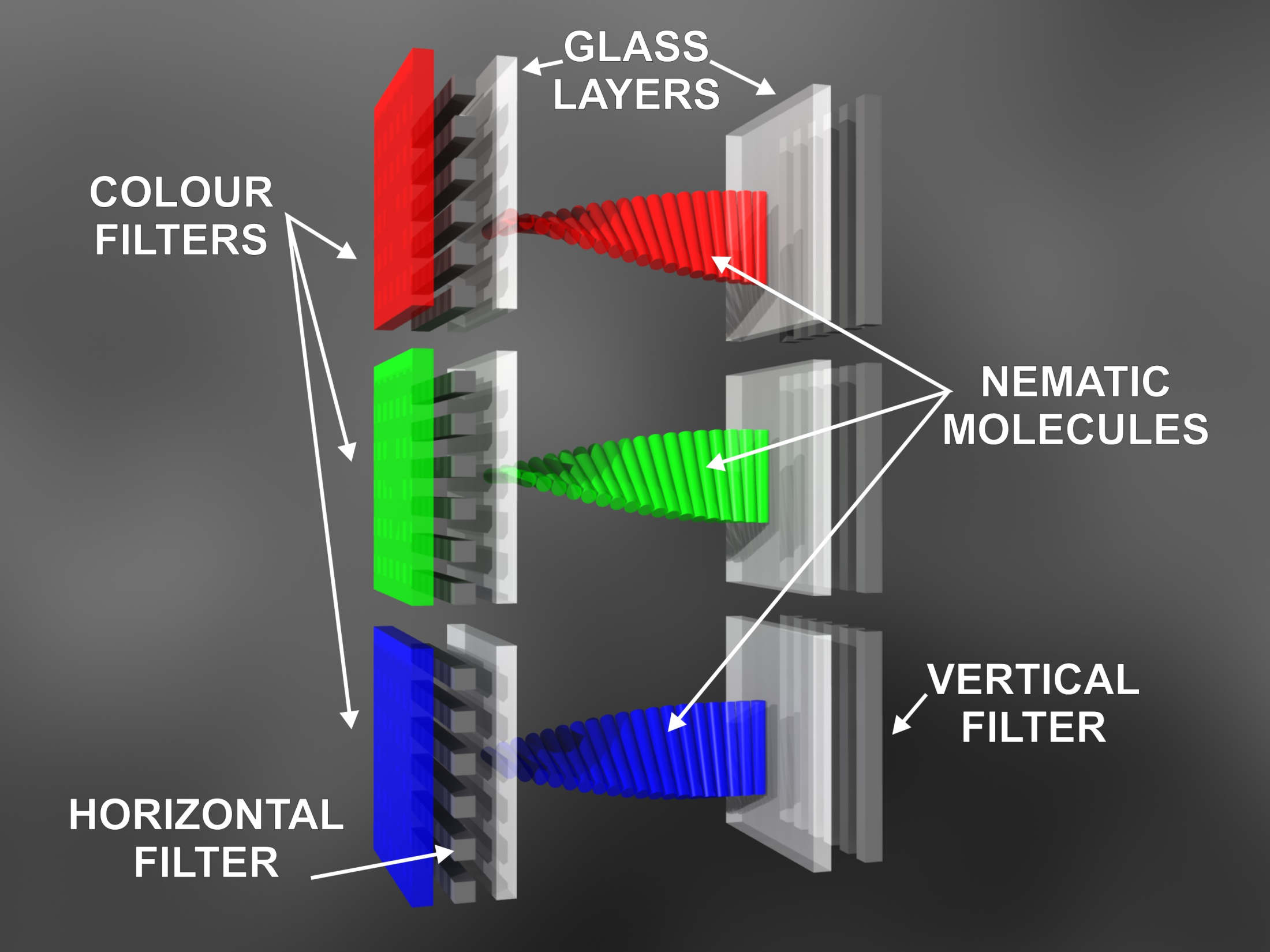
The electrode at which oxidation occurs is named the anode and is negatively charged.

The electrode at which reduction occurs is named the cathode and is positively charged.

There are two electrodes on each side of liquid crystal in an LCD. On electrode is positive and the other negative.

To turn on a pixel a grid is made on the back from rows and columns of a transparent conductive material called indium-tin oxide. Which these are the electrodes that are connected to the integrated circuits that send a charge down and across these columns and rows. At the point where these charges meet the voltage is given to specific pixel and it turns it on.



When electric current induce liquid crystal molecules they tend to align in a helical shape. Their shape guides the polarized light to match the transmission axis of the second polarizer and go through. When there is no current the crystal liquid molecules tend to align in one direction which prevents light from passing through.